LIYAN PROGRAMMABLE LOGIC CONTROLLER

LYPLC EX485LNK

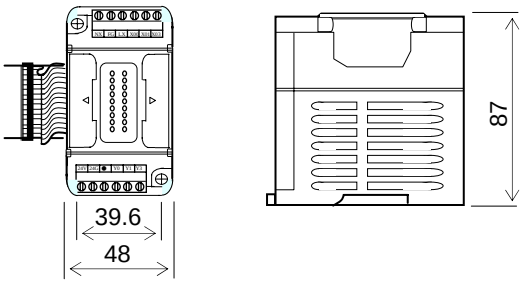
USER'S MANUAL

EX485LNK

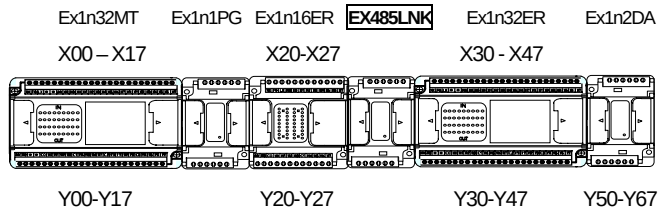
1. Introduction

The RS422/485 interface block EX485LNK (hereinafter referred to as “485LNK”) is connected to the Ex1n, Ex2n series programmable controller to realize half duplex serial data communicated with RS485 interface such as inverter, thermometer … etc.

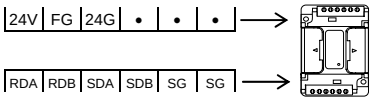
1.1 Dimensions



1.2 Connection with PLC



♦ Terminal signals:



1.3 Outline of Product

1) Applicable programmable controller
   The 485LNK can be connected as a special block of the Ex1n, Ex2n programmable controller.
2) Control instructions
   Send/receive data is received and sent and diversified control commands are manipulated using the FROM/TO instruction.
3) Number of I/O points and connection method
   The number of I/O points occupied is 0. However the capacity of the 5V power supplied from the programmable controller is limited.
   The current consumption of the 5V power of the 485LNK is 40mA. Make sure that the total current consumption of the 5V power including other special blocks is equivalent to or less than that available.
4) Communication method
   Half duplex start-stop synchronization and no protocol procedure are used. The communication format can be specified using the buffer memories (BFMs).
5) Send/receive buffer
   The send/receive buffer can accommodate 128 bytes/64 words.
6) ASCII/HEX conversion function
   The function to convert and send a hexadecimal numeric (0 to F) saved in the send data buffer as well as the function to convert a received ASCII code into a hexadecimal numeric (0 to F) and save it to the receive buffer are provided.

2. Allocation of Buffer Memories (BFM's)

The RS422/485 interface block EX485LNK (485LNK) transmits data with the programmable controller via the buffer memories BFMs (16-bit RAM memories) in the 485LNK.

FNC78 (FROM) and FNC79 (TO) instructions are used to read and write the buffer memories.

2.1 BFM List

BFM No.	Name	Setting range	Initial value	R: For read W: For write
#0	Communication format	---	0086H	W
#1	Command	---	0	W
#2	Reserved	---	0	X
#3	Receive time-out time	1 to 32,767 (X 10 ms) "0" eliminates time-out time.	0	W
#4 **#5**	Send header, lower 2 bytes Send header, upper 2 bytes	4 bytes max., zero suppression	0 (no header) 0	W
#6 **#7**	Send terminator, lower 2 bytes Send terminator, upper 2 bytes	4 bytes max., zero suppression	0 (no terminator) 0	W
#8 **#9**	Receive header, lower 2 bytes Receive header, upper 2 bytes	4 bytes max., zero suppression	0 (no header) 0	W
#10 **#11**	Receive terminator, lower 2 bytes Receive terminator, upper 2 bytes	4 bytes max., zero suppression	0 (no terminator) 0	W
#12	Receive suspension waiting time (in interlink connection)	0 to 32,327 (X 10 ms)	0	W
#13	Number of remaining send data	0 to 128 (when data length is 16 bits) 0 to 64 (when data length is 8 bits)	0	R
#14	Number of receive buffers	0 to 64	0	R
#15	Send sum result	---	0	R
#16	Receive sum result	---	0	R
#17	Station no. of this module	0 to 255	0FFH	W
#18	Amount of total connected stations	1 to 32	1	W
#19	Station no. in connection (Hex)	Write 1-32 automatically	---	R
#20	The beginning address of storing received data of 1st station	1000 ~ 7679	1000	W
#21	Assign space of memory in every station (receive)			
#22	The beginning address of sent data of 1st station	1000 ~ 7679	2000	
#23	Assign space of memory in every station (send)			
#24	Amount of received (read) word in every station	1 ~ 32		
#25	Amount of sent (written) word in every station	1 ~ 32		
#26	Reserved			
#27	Reserved			
#28	Status	---	0	R
#29	Error code	---	0	R
#30	Model code	---	71xx	R
#31	Reserved	---		
#32 to #63	Read slave 01 address to Read slave 32 address			
#64 to #95	Write slave 01 address to Write slave 32 address			
#96 to #99	Reserved			
#100 to #799	System reserved; Using is prohibited			
#1000 to #7679	User Define Area			

Note : Memory configuration can not be more than BFM#7679

2.2 Communication Format <BFM#0>

Bit	Description	0	1	Initial value
b0	Data length	7 bit	8 bit	1 : 8 bit
b1 **b2**	Parity	b2~b1 (00) : None (01) : Odd (11) : Even		(11) : Even
b3	Stop bit	1 bit	2 bit	0 : 1 bit
b4 **b5** **b6** **b7**	Baud rate (bps)	b7~b4 (0101) : 1200 (0110) : 2400 (0111) : 4800 (1000) : 9600 (1001) : 19200 (1010) : 38400 (1011) : 57600 (1100) : 115200		(1000) : 9600 bps
b8 **b9**	No used	---		0 : No used
b10 **b11**	No used			0 : No used
b12 **b13**	No used	---		0 : No used
b14	Send/receive buffer data length	16 bit	8 bit	0 : 16 bit
b15	No used	---		0 : No used

The communication format is determined on the rising edge of the send/receive enable command (BFM#1 b8, b9, b10, b11). Accordingly, the setting of the communication format should be preliminary transferred using the TO instruction before send command is turned on. Also, the send header and the send terminator are determined in the rising edge of the send command. The receive header and the receive terminator are determined on the rising edge of send command or on the rising edge of the receive completion reset command.

2.3 BFM#1 Command

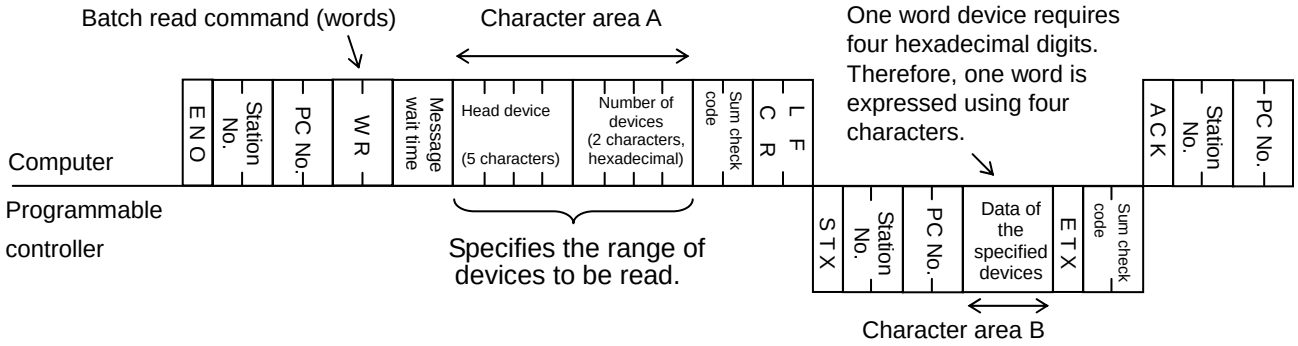
Bit	Description
b8	Computer Link mode
b9	Modbus Ascii mode
b10	Modbus Rtu mode
b11	User Control mode
b14	Modbus Ascii broadcast function
b15	Modbus Rtu broadcast function

1) b8 Computer link mode (Format 4)

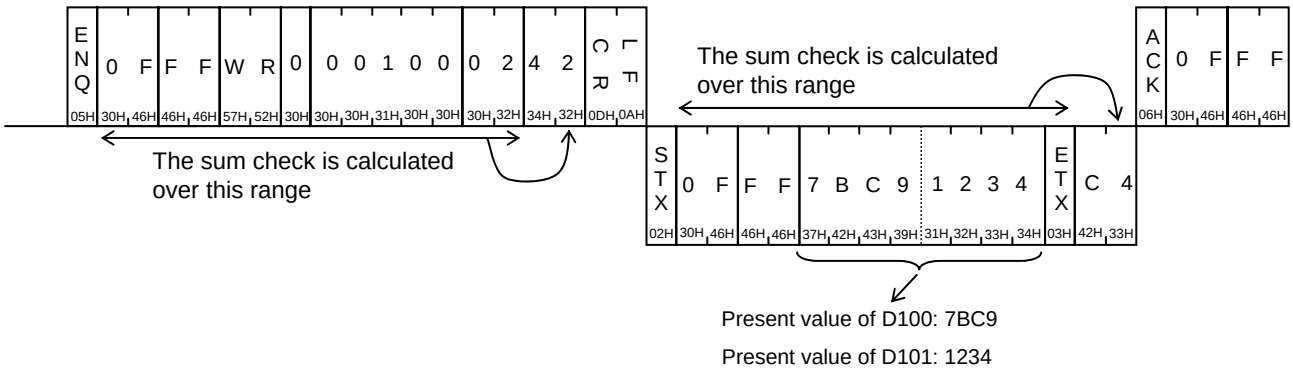
While b8 is turned on, the 485LNK can send and receive data.

On the rising edge of b8, the error occurrence (BFM#28 b3) and the error code (BFM#29) are cleared.

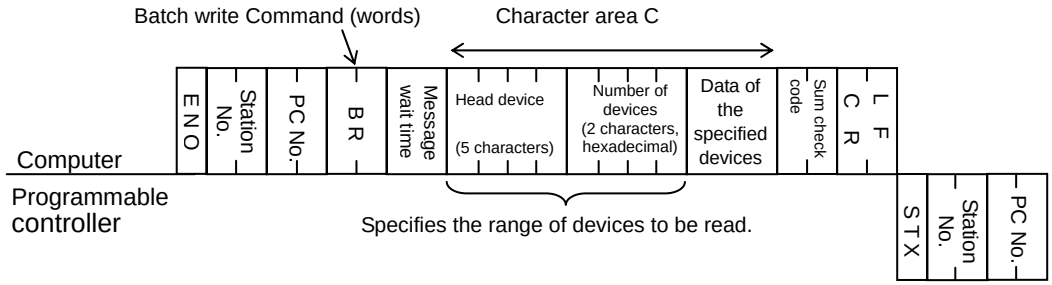
<WR command>



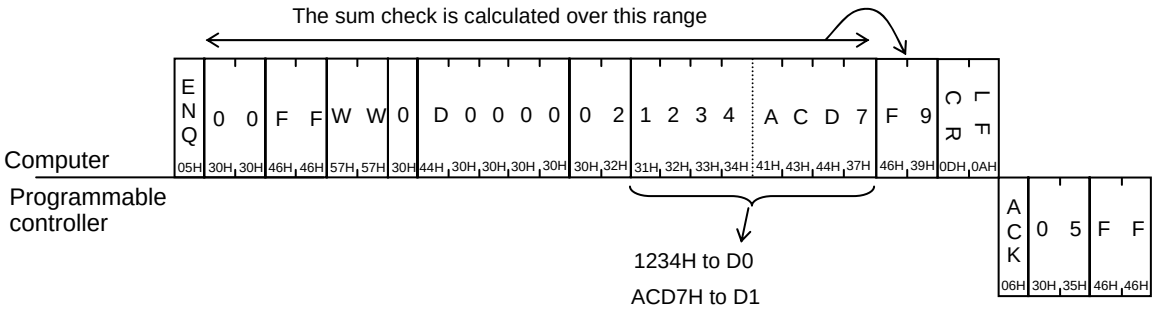
Example: To read the present value of two points, D100 and D101 at station No.15 (F)



<WW command>



Example: To write data to two points, D0 and D1, at station No.0 (with message wait time set to 0 ms).



2) b9 Modbus mode (ASCII)

While b9 is turned on, the 485LNK can send and receive data.

On the rising edge of b9, the error occurrence (BFM#28 b3) and the error code (BFM#29) are cleared.

<Command code 03H; read N word>

Example: Read 2 word from BFM#00 of station no. 01H continuously.

<command message>

3Ah	01h		03h		00h		00h		00h		02h		FAh		0Dh	0Ah
':'	'0'	'1'	'0'	'3'	'0'	'0'	'0'	'0'	'0'	'0'	'0'	'2'	'F'	'A'	CR	LF
STX	ADR1	ADR0	CMD1	CMD0	Start Address				Word Count				LRC CHK1	LRC CHK0	END1	END0

Note: command message CHK (check sum) calculation

01H+03H+00H+00H+00H+02H=06H

2's complement of 06H : FFH-06H+1=FAH

<response message>

3Ah	01h		03h		04h		00h		00h		00h		00h		F8h		0Dh	0Ah
STX	ADR1	ADR0	CMD1	CMD0	Byte Count		Data BFM#00				Data BFM#01				LRC CHK1	LRC CHK0	END1	END0
':'	'0'	'1'	'0'	'3'	'0'	'4'	'0'	'0'	'0'	'0'	'0'	'0'	'0'	'0'	'F'	'8'	CR (0D)	LF (0A)

Note: response message CHK (check sum) calculation

01H+03H+04H+00H+00H+00H+00H=08H

2's complement of 08H : FFH-08H+1=F8H

<Command code 10H; write N word>

Example: Write data 8765H and 4321H to BFM#05 and BFM#04 of station no. 01H

<command message>

3Ah	01h		10h		00h		04h		00h		02h		04h		43h		21h		87h		65h		84h		0Dh	0Ah
':'	'0'	'1'	'1'	'0'	'0'	'0'	'0'	'4'	'0'	'0'	'0'	'2'	'0'	'4'	'4'	'3'	'2'	'1'	'8'	'7'	'6'	'5'	'8'	'4'	CR	LF
STX	ADR1	ADR0	CMD1	CMD0	Start Address				Quantity				Byte Count		The content of BFM#04				The content of BFM#05				LRC CHK1	LRC CHK0	END1	END0

<response message>

3Ah	01h		10h		00h		04h		00h		02h		E9h		0Dh	0Ah
STX	ADR1	ADR0	CMD1	CMD0	Start Address				Quantity				LRC CHK1	LRC CHK0	END1	END0
':'	'0'	'1'	'1'	'0'	'0'	'0'	'0'	'4'	'0'	'0'	'0'	'2'	'E'	'9'	CR	LF

3) b10 Modbus mode (RTU)

While b10 is turned on, the 485LNK can send and receive data.

On the rising edge of b10, the error occurrence (BFM#28 b3) and the error code (BFM#29) are cleared.

<Command code 03H; read N word>

EX.: Read 2 word from BFM#00 of station no. 01H continuously.

<command message>

	01h	03h	00h	00h	00h	02h	XXh	XXh	
STOP above 10ms	ADR	CMD	Start Address		Word Count		CRC CHK Low	CRC CHK High	STOP above 10ms

<response message>

	STOP above 10ms	ADR	CMD	Byte Count	Data BFM#00		Data BFM#01		CRC CHK Low	CRC CHK High	STOP above 10ms
		01h	03h	04h	00h	00h	00h	00h	XXh	XXh	

<Command code 10H write N word>

EX.: Write data 8765H and 4321H to BFM#05 and BFM#04 of station no. 01H

<command message>

	01h	10h	00h	04h	00h	02h	04h	43h	21h	87h	65h	XXh	XXh	
STOP above 10ms	ADR	CMD	Start Address		Quantity		Byte Count	Content of BFM#04		Content of BFM#05		CRC CHK Low	CRC CHK High	STOP above 10ms

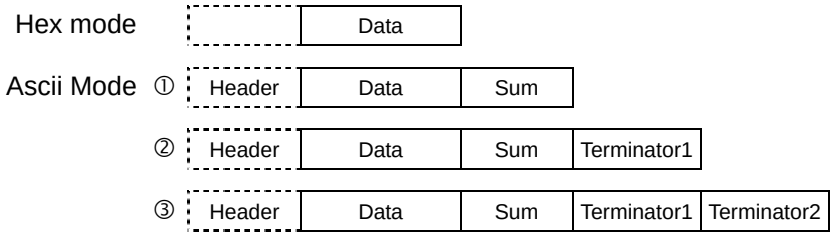
<response message>

	STOP above 10ms	ADR	CMD	Start Address		Quantity		CRC CHK Low	CRC CHK High	STOP above 10ms
		01h	10h	00h	04h	00h	02h	XXh	XXh	

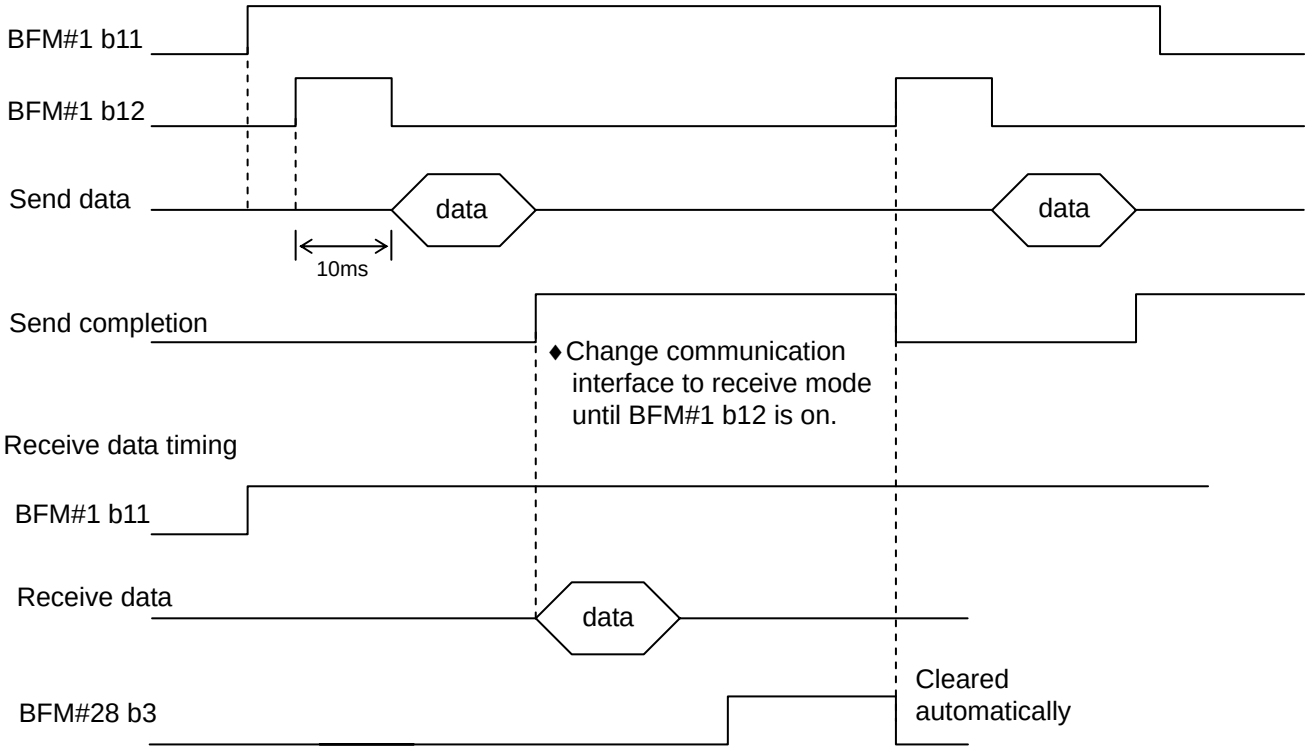
4) b11 User Control mode (half duplex)

While b11 is turned on, the 485LNK can send (master unit) and receive data (slave unit) on the rising edge of BFM#1 b12. Start to send BFM#25 amount of sent word which is set. At this mode, setting value of BFM#32~#63 and BFM#64~#95 are not used.

♦Communication format



♦Send data timing



♦Receive data timing

5) b14 Modbus Ascii broadcast function

When b14 is turned on, 485LNK will send broadcast message once. Every slave will receive and handle broadcast message, but all slaves will not respond.

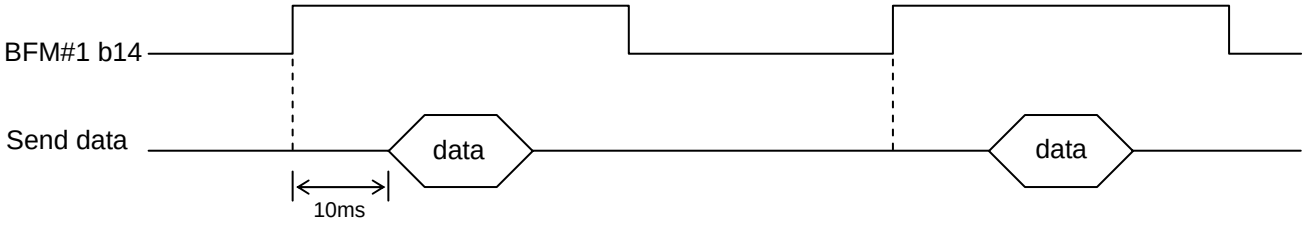
<Message format>

	1		2		3				4				5		6				7							
3Ah	00h		10h		00h		04h		00h		02h		04h		43h		21h		87h		65h		84h		0Dh	0Ah
':'	'0'	'0'	'1'	'0'	'0'	'0'	'0'	'4'	'0'	'0'	'0'	'2'	'0'	'4'	'4'	'3'	'2'	'1'	'8'	'7'	'6'	'5'	'8'	'4'	CR	LF
STX	ADR1	ADR0	CMD1	CMD0	Start Address				Quantity				Byte Count		The content of BFM#04				The content of BFM#05				LRC CHK1	LRC CHK0	END1	END0

1. Station number: station number of broadcast message is fixed as 00h.
2. Instruction: 10h is instruction to write N word.
3. Start Address: it is decided by BFM#64
4. Quantity of written word: it is decided by BFM#25
5. Byte Count: 1 word is 2 bytes. In this example, written word is 2, so bytes are 4.
6. First word: data which is written to BFM#4 of slave. (*)
7. Second word: data which is written to BFM#5 of slave. (*)

(*): Content of data is decided by BFM#22. If BFM#22=2000, first word is content of BFM#2000 and second word is content of BFM#2001.

<Send data timing>



6) b15 Modbus Rtu broadcast function

When b15 is turned on, 485LNK will send broadcast message once. Every slave will receive and handle broadcast message, but all slaves will not respond.

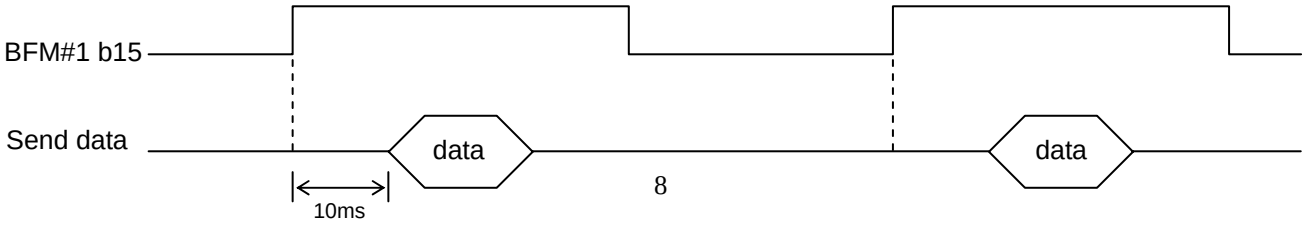
<Message format>

	1	2	3		4		5	6		7				
	00h	10h	00h	04h	00h	02h	04h	43h	21h	87h	65h	XXh	XXh	
STOP above 10ms	ADR	CMD	Start Address		Quantity		Byte Count	Content of BFM#04		Content of BFM#05		CRC CHK Low	CRC CHK High	STOP above 10ms

1. Station number: station number of broadcast message is fixed as 00h
2. Instruction: 10h is instruction to write N word.
3. Start Address: it is decided by BFM#64
4. Quantity of written word: it is decided by BFM#25
5. Byte Count: 1 word is 2 bytes. In this example, written word is 2, so bytes are 4.
6. First word: data which is written to BFM#4 of slave. (*)
7. Second word: data which is written to BFM#5 of slave. (*)

(*): Content of data is decided by BFM#22. If BFM#22=2000, first word is content of BFM#2000 and second word is content of BFM#2001.

<Send data timing>



2.4 Receive Upper Limit Byte Count <BFM#2>

Setting range: 1 to 128 (when buffer data length is 16 bits).
1 to 64 (when buffer data length is 8 bits)
"0" is regarded as "128" or "64". The initial value is "0".

BFM #2 specifies the maximum byte count received by the 485LNK.

When data is received up to the receive upper limit byte count, the receive completion status (BFM#28 b1) is set.

2.5 Receive Time-out Time <BFM#3>

Setting range: 1 to 32,767 (x 10ms)
"0" eliminates time-out time. The initial value is "0".

BFM#3 specifies the receive data waiting time limit.

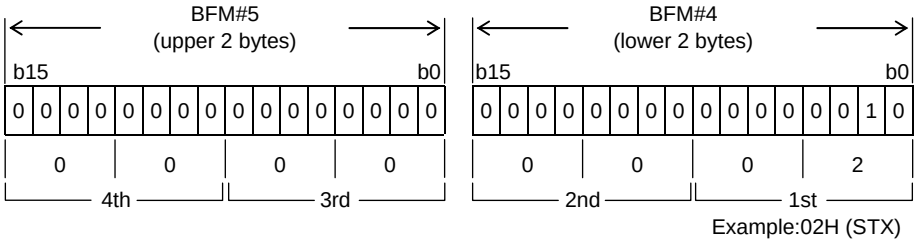
When the next data is not received within the receive time-out time starting from the receive edge of each data, the receive time-out flag (BFM#28 b2) is set to "ON", it is regarded that receive is completed, and the receive completion status (BFM#28 b1) is set.

At link mode (BFM#1 b8,b9,b10 is set to "ON"), if preset value is "0", then it can't restart communication when error occurred.

2.6 Send Header <BFM#5 (upper), BFM#4 (lower)>

Setting range: 4 bytes maximum, zero suppression
The initial value is "0" (No used).

For the send data of the 485LNK, 4 headers maximum can be specified. When the number of headers is less than 4, the upper "0"s are ignored (zero suppression) and not transferred.



♦ The transmission order is fourth header, third header, second header, first header when 4 headers are specified.

2.7 Send Terminator <BFM#7 (upper), BFM#6 (lower)>

Setting range: 4 bytes maximum, zero suppression
The initial value is "0" (No used).

For the send data of the 485LNK, 4 terminators maximum can be specified. When the number of terminators is less than 4, the upper "0"s are ignored (zero suppression) and not transferred.

As the first terminator, specify an ASCII code from 01_H to $1F_H$. (As the second to fourth terminators, any ASCII code can be specified.)

The register structure and the transmission order are equivalent to those of the send header described above.

2.8 Receive Header <BFM#9 (upper), BFM#8 (lower)>

Setting range: 4 bytes maximum, zero suppression
The initial value is "0" (No used).

For the receive data of the 485LNK, 4 headers maximum can be specified. When the number of headers is less than 4, the upper "0"s are ignored (zero suppression).

The register structure and the transmission order are equivalent to those of the send header described above.

2.9 Receive Terminator <BFM#11 (upper), BFM#10 (lower)>

Setting range: 4 bytes maximum, zero suppression

The initial value is “0” (No used).

For the receive data of the 485LNK, 4 terminators maximum can be specified. When the number of terminators is less than 4, the upper “0”s are ignored (zero suppression).

As the first terminator, specify an ASCII code from 01_H to $1F_H$. (As the second to fourth terminators, any ASCII code can be specified.)

The register structure and the transmission order are equivalent to those of the send header described above.

2.10 Receive Suspension Waiting Time <BFM#12>

Setting range: 0 to 32,767 (x 10ms)

The initial value is 0 ms.

At link mode (BFM#1 b8,b9,b10 is set to “ON”), when send/receive completion, it will be changed to delayed time of communication with next station.

2.11 Number of Remaining Send Data <BFM#13>

Saved value: 0 to 128 (when buffer data length is 16 bits)

0 to 64 (when buffer data length is 8 bits)

The send byte count reduced by the number of data actually sent is during transmission.

2.12 Number of Receive Buffers <BFM#14>

Saved value: 0 to 64

The number of buffers which have actually received data is saved in turn with regard to the receive buffers.

2.13 Send Sum Result <BFM#15>

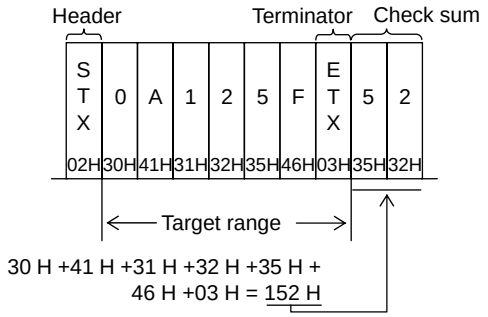
Initial value: 0

The check sum value added to the send data is saved.

The sum check target range and the calculation method are shown below.

Note: Sum check target range and calculation method

Example:



The total value including the terminator and excluding the header (1st byte of the header only) is calculated. Then, the lower 1 byte is converted into the ASCII code, and sent or received. The data converted into the ASCII code is placed in the order of upper digit and lower digit.

2.14 Receive Sum Result <BFM#16>

Initial value : 0

The sum check value of the receive data is saved.

When the check sum added to the receive data is different from the receive sum result, “receive sum check error” occurs.

The sum check target range and the calculation method are equivalent to those for the send sum result described above.

2.15 Station no. of this module <BFM#17>

At link mode, it is controlled by internal system.

2.16 Assign space of memory in every station (receive) <BFM#21>

If BFM#20 as 1000 and BFM#21 as 20 are set, then the beginning address of storing received data of 2nd station is 1020. The beginning address of storing received data of 3rd station is 1040…and so on.

2.17 Assign space of memory in every station (send) <BFM#23>

If BFM#22 as 2000 and BFM#23 as 20 are set, then the beginning address of sent data of 2nd station is 2020. The beginning address of sent data of 3rd station is 2040…and so on.

2.18 Status <BFM#28>

Bit	Description
b0	Reserved
b1	Send completion
b2	Reserved
b3	Receive completion
b4	Error Occurrence
b5	I/O status
b6	Being sent
b7	Being received

Bit	Description
b8	
b9	
b10	
b11	
b12	
b13	
b14	
b15	

The 485LNK status and the send/receive result are saved as status information. The information can be read from the programmable controller using the FROM instruction, then utilized.

1) b1 (send completion)
   When send of data up to the send byte count is completed, the send completion status (b1) is set. The send completion status (b1) is automatically reset when the next send command (BFM#1 b1) set to “ON”.
2) b5 (I/O status)
   This module is half duplex. It is for getting communication interface is output (when value=1) or input (when value=0) status.
3) b6 (being sent)
   b6 is turned on after the send command (BFM#1 b1) is given until the send completion status (BFM#28 b0) is set.
4) b7 (being received)
   b7 is turned on after the head data is received until the receive completion status (BFM#28 b1) is set.

2.19 Model Code <BFM#30>

The model code of the 485LNK is “7xxx”.

♦ 7 1 1 0
- Version : V1.10
- MODEL CODE

LIYAN PROGRAMMABLE LOGIC CONTROLLER

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